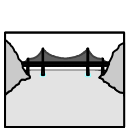


# Principles and General Requirements

Several requirements recurred in so many of the sections that it became obvious they constituted overarching considerations. These have been consolidated into Principles and General Requirements.

## Principles

- Dominance. This is the principle that in virtually all things a relatively small number of factors dominates the outcome. It is of the utmost importance that this assessment not leave out any factors which dominate the results. Yet the magnitude of work and cost of the analysis must be responsibly managed. Sensitivity analyses, parametric analyses, and related methods will be used to identify and rank order the factors which dominate the outcome of this assessment. These factors may be physical attributes of the Hanford Site or waste disposal, or they may be technical characteristics and challenges within the study itself. Assumptions framed through expert judgment (in lieu of repeatable analyses) will not be used to identify dominant factors or discard smaller contributors. The resulting understanding of relative importance will be used to focus technical emphasis, management oversight, and assessment planning, as well as Hanford Site budget estimates and funding allocation for the CRCIA. This principle and its implementation while managing uncertainty is discussed more fully in Appendix II-C, Analytical Approach and Methods

- Uncertainty. The relative uncertainty inherent in assessment results will be quantified and used in the technical definition of the assessment as well as in the study's management and allocation of resources. The level of uncertainty which can be tolerated in using the study results as a basis for cleanup decisions will be a guiding requirement. Uncertainty will be uniformly managed across the various study tasks. Methods such as "Value of Information" (from decision theory) will be used to determine the usefulness of spending more effort to reduce uncertainty. It also will be recognized that uncertainty and the dominance principle are coupled. This is more fully addressed in Appendix II-C.

Care must be taken by the analysts not to dismiss an effect which may be important from a cultural perspective simply because popular analytical approaches may discard such effects.

- Fidelity of Assessment Results. In the same sense that a high-fidelity sound system faithfully reproduces the original musical performance with clarity and discernible differences among instruments, this assessment must be capable of detecting an impact and resultant effect which is or will be significant to the people affected by the cleanup and waste disposal decisions made at Hanford (see Figure 2). In this context, fidelity in this assessment includes the concepts of accuracy, resolution of information in both time and location, and statistical significance. Perhaps the primary consideration is that assessment results have enough fidelity to distinguish among cleanup and disposal alternatives in the Hanford Site decision-making process. Care must be taken by the analysts not to dismiss an effect which may be important from a cultural perspective simply because popular analytical approaches may discard such effects. This principle imposes a difficult challenge on those who do the technical design of the

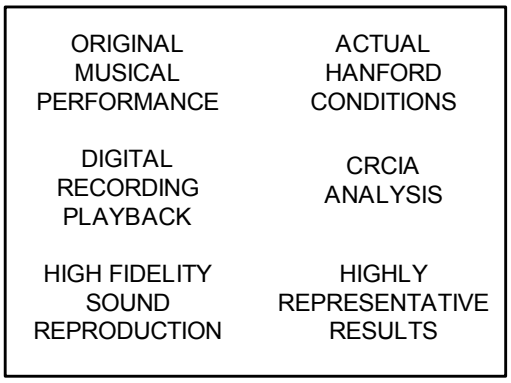



Figure 2. Fidelity

assessment. An appreciation of cultural and socio-economic values of the river-dependent people is requisite to an acceptable assessment.

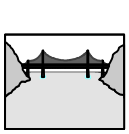
- Preeminent Principles. Of all the requirements and guidance imposed by Part II of this document, by far the most important are dominance, uncertainty, and fidelity. Each is highly dependent upon the other two. Together they outweigh all other considerations by a wide margin in technically designing the assessment, in making budget decisions, and in making day-to-day technical and management choices.

- Use of Expert Judgment. Experienced, knowledgeable analysts are expected to exercise their skills and judgment with the highest professionalism in planning and conducting this assessment. Substituting expert judgment for analytical quantification should, however, be avoided unless there is convincing rationale to the contrary. Clearly, time, available resources and significance of the matter at hand must guide the analysts. The bases in making such choices are credibility and replication. Pivotal matters in the assessment must be able to be replicated by qualified professionals outside of the Hanford community. The assessment cannot be placed in a position of disrepute because results cannot be verified.

- Development and Use of Assumptions. Adherence to the requirements in Part II should eliminate the need to make arbitrary assumptions to conduct the assessment. If, however, it becomes apparent that assumptions are needed, CRCIA Board approval must be sought before implementation of the candidate assumptions. Those with merit will likely result in a revision to Part II of this document. The analyst must document all assumptions.

- Integration of Tasks Within the Assessment. As the assessment is subdivided into work tasks, care will be exercised to ensure consistency and compatibility in the application of requirements, use of data, seamlessness of modeling, management of uncertainty, and related factors bearing on overall assessment quality.

- Integration With Other Site Efforts. Two primary areas require continuous management integration aside from the assessment tasks. First, the assessment must remain integrated with cleanup and waste disposal decisions including related environmental impact statements, records of decision, conceptual



design contract awards, planning bases for budget submittals, strategic planning, and Hanford Site project requirements documents. Second, integration must be achieved and maintained with other related analytical efforts, especially other studies involving the Columbia River. Any analyses involving the river or river corridor are expected to comply with the applicable portion of the requirements of Part II. Information from other studies may be used in this assessment only if those studies meet the requirements in Part II.

- Use of Other Study Results. While assessment efforts should not duplicate work appropriately done elsewhere, data which do not meet the requirements in Part II are not acceptable without convincing justification. This assessment will, however, use the Hanford Site disposition baseline for definition of disposal methods and, if available, estimates of containment performance. Composite source term information compiled elsewhere may be used if it meets CRCIA requirements.

- Research and Development of Analysis Methods. Several of the important objectives of this assessment lie beyond conventional analytical practices. Projecting mutagenic and cultural effects are examples. Modification of existing methods and development of new techniques will be needed. Design and planning of the assessment must include preliminary research and development (R&D) tasks to assure that proper analytical tools and technical information will be available as needed.

- CRCIA Phased Approach. While the CRCIA Team strove to capture the requirements for this assessment independent of any given definition or sequence of work tasks, a phased pattern seems to emerge. What may be thought of as the core set of calculations (such as contaminant inventory compilation, modeling, and exposure calculation) is described in Section 1.0. The elements of this core process received a high percentage of the CRCIA Team's attention. The screening assessment (Part I) represents the first phase of work in performing CRCIA and used some elements of this core process in assessing the current state of the Columbia River.

  The next phase of work will center on designing and planning (including budget estimates and schedules) the work necessary to respond to the comprehensive requirements in Part II. This planning phase also may include some of the preparatory tasks requisite to the core process. Following the planning phase, the remaining preliminary tasks and analytical tools preparation will likely require a level of effort large enough to become recognized as the next phase of the assessment.

  The first effort to produce useable assessment results constitutes the first phase following completion of the preparatory tasks. It will be complete when the core process has produced impact assessment results for each of the prescribed scenarios based upon the aggregate set of Hanford waste closure end states. Figure 4 graphically depicts this phase. The figure also shows each subsequent phase as being initiated by a planned or actual change in the Hanford post-cleanup end state. Performance of these iterative phases will be aligned with the timetable for key cleanup decisions, annual updates of strategic planning products, Hanford Site budget submittals, and 5-10 year plan revisions.

## General Requirements

- Columbia River Area to be Assessed. The geographic section of the Columbia River to be assessed begins at the Priest Rapids Dam and proceeds downstream to the river's mouth at Astoria, Oregon. It includes the riparian zone on either side of the Columbia River and irrigation water drawn from the river. It also includes the aquatic and terrestrial life which depends on the river for biological, social, or economic reasons. It is stressed that the water ingested from the Hanford Reach area includes undiluted, or only somewhat diluted, groundwater found in seeps and springs in the riparian zone as well as groundwater upwellings in the river bottom where aquatic life habitat is found.

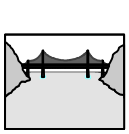
- Time Period of Potential Impact. The time period for which the impact to and through the Columbia River is to be assessed begins with the federal government's acquisition of Hanford lands in 1943. It continues through the period during which the radioactive and chemical materials remain intrinsically harmful, including radioactive decay daughter products and chemical reaction products. The current regulatory horizon (about 30-50 years) is inconsistent with the long term hazard from Hanford Site wastes and materials. The assessment must be guided by the materials' period of intrinsic hazard rather than the regulatory period.

  It is beyond the scope of CRCIA to make estimates of past injury or damages. Nevertheless, to the extent that past Hanford events have resulted in present day cumulative effects or conditions which bear on future river related impact, these past events must be understood and taken into account in this assessment.

- Radioactive and Chemical Materials. Calculations involving radioactive and hazardous materials data will include radioactive decay daughter products and chemical compounds/properties estimated to occur with time and after reaction with other chemicals, soils, and river chemistry.

- Impact Comparison Baseline. "Impact" as used throughout this assessment is to mean and will be compared with conditions existing prior to the federal government's construction of the Hanford Site complex. Generally, this pre-Hanford state will be equated with today's conditions upstream from Hanford to the Priest Rapids Dam. However, it is recognized that some elements of this ecosystem baseline must refer to conditions above the dam in order to capture meaningful information.

- CRCIA Standards. Contaminant concentrations and doses prescribed in regulations can be used in the assessment for general information and guidance. However, caution must be exercised because few, if any, current regulations were written with the spectrum of effects in mind that are of interest in this assessment such as mutagenic effects, teratogenic effects, and cultural effects. Elevated levels of contaminants will not be ignored because they lie below regulatory levels or because of the absence of accepted research linking such contaminant levels to adverse effects. The assessment analysts must develop criteria for elevated levels which should be of concern based on considerations such as naturally occurring background levels of the contaminants, the presence of multiple contaminants and multiple exposure pathways, general environmental cleanup experience, the body of regulatory experience, and historical environmental events such as Chernobyl. Other considerations include health physics accepted practice, international standards such as those of the International Commission on Radiological



Protection, cause and effect correlations from the medical community, and new developments in ecology, toxicology, and risk assessment. In addition to the need for criteria for elevated contaminant levels, criteria also must be developed for the aggregate tolerable contaminant load in groundwater and total plume size, both based on the presence of multiple contaminants.

- Required Results. A primary result of the assessment is the actual or projected dose level from Hanford derived contaminants for each receptor and each dominant contaminant as it varies with time throughout the time period of interest. Receptor resultant impact will also be determined. These determinations must be made for individual dominant contaminants as well as multiple contaminants which, when assessed in combinations occurring at the same time, result in elevated toxicity levels above CRCIA standards criteria (see Standards, above). Analysts might expect to find suspiciously high levels of some contaminants for which biological effects are not well established. Any such findings must be retained and reported. From the concerns expressed by CRCIA Team members, some potential effects have been defined (see Appendix II-A, Section 9.0) which must be evaluated to determine the potential for their existence and their severity.

- Assessment Control. The aggregate of the requirements in Part II of this document makes indispensable a relentless, intense attention to control of the conduct of the assessment. Sensibly applying, and maintaining, the delicate balance among the principles of dominance, management of uncertainty, and fidelity require thoughtful conceptualization and planning of the assessment as well as continual reassessment and rebalancing of the on-going effort. The burden of this effort rests primarily on the performing contractor, particularly the assessment project manager. As described in Appendix II-D, final decision authority rests with the CRCIA Board, which will remain actively involved in managing the assessment. However, the DOE project manager, designated in Appendix II-D by the Board as the CRCIA Executive Administrator, shares the responsibility of ensuring the assessment meets the letter and intent of these requirements.

- Assessment Frequency. The description of recurring CRCIA assessments for each successive revision of DOE's planned site end state is found in Section 1.0 and is illustrated in Figure 4. Additional iterations of the assessment will be needed, however, in response to such developments as results from atmospheric studies which suggest new environmental scenarios, significant changes in data from Hanford studies, new information which causes changes in CRCIA models and related tools, and advances in ecology and toxicology.

- Required Continuation of Columbia River Monitoring. Much of the basis for detecting trends in river changes, so important to realistic assessment results, comes from monitoring current groundwater and river conditions. It is essential that the monitoring program be continued and periodically refocused to the findings and needs of this assessment.